APPENDIX 1 – OLD GROWTH MANAGEMENT ON THE LOLO NATIONAL FOREST

1986 FOREST PLAN

Old Growth Definition – 1986

In the 1986 Forest Plan, old growth is defined as "***overmature timber***; *individual trees or stands of trees that in general are past their maximum rate in terms of the physiological processes expressed as height, diameter, and volume growth."*[1]

Old Growth Allocation – 1986

As a strategy for meeting non-game species needs, the 1986 Plan allocated 8% of its land area to old growth, evenly distributed within the Forest's six habitat groups, and evenly distributed within each of the Forest's 71 major watersheds.[2] The 8% was based on interpretation of the literature available at the time concerning minimum habitat needs for various old-growth associated species including the pileated woodpecker, fisher, pine marten, and northern goshawk. It was assumed that those species could utilize the same acres, and that they could co-exist; therefore individual allocations of habitat for each species were not needed.[3]

As part of development of the Forest Plan, old growth was inventoried on all non-wilderness lands using a forest inventory system of photo interpretative (PI) data and field sampling. For wilderness lands, aerial photos and employee knowledge were used to identify approximate levels of old-growth. FORPLAN modeling runs used to develop the Plan indicated that between one-third and one-half of the Forest was to be allocated to roadless, wilderness, Research Natural Areas (RNA), and unsuitable allocations. Because no harvesting would occur in those areas, the Lolo did not add 8% to drainages that already had substantial amounts of old growth within unsuitable allocations. Rather, the Lolo allocated old-growth as needed to assure that each drainage had the minimum amount within each of the six habitat groups, including what would exist naturally within roadless, wilderness, RNA, and unsuitable lands. The 1986 Forest Plan Final Environmental Impact Statement (FEIS) calculated that approximately 489,000 acres (23%) of the Forest would be available for old growth associated species in wilderness and roadless areas.[4] Another 43,854 acres of the Forest would be allocated to provide vegetative and spatial diversity. The Forest Plan FEIS calculated that the selected alternative (Alternative D) would retain old growth for viable populations of most species (especially old growth associated species) within about 79% of the Forest's 71 major drainages.[5] Because of mixed ownership (large amounts of private land), it was determined that it was not possible to retain 8% old growth in approximately 21% of the Forest's drainages.

Management Area 21

Approximately 41,303 acres (2%) of the Lolo were allocated to Management Area 21 (old-growth) in the 1986 Forest Plan.[6] This Management Area consists of a variety of forested lands representing all elevations, aspects, habitat groups, and growing site conditions. Management Area 21 is located throughout the Forest in such a way as to evenly distribute old age stands of timber for wildlife species dependent on old growth for habitat. As described in the Plan, *"the goals of MA 21 are to provide for old-growth succession in timber stands with an optimum arrangement of habitat components to maintain viable populations of old-growth dependent wildlife species."* MA 21 is classified as suitable for timber production. The Plan states that timber harvest will be employed to improve or maintain old-growth habitat. It describes that timber stands will be managed on a double rotation basis to provide suitable old-growth habitat. The Plan provides for management of stands at least 30 to 40 acres in size that are decadent, multi-storied, fully stocked, contain snags with dead and down material greater than 15 tons per acre, and contain 15 trees per acre greater than 20 inches dbh. The Plan indicates that these stands will be well distributed over the Forest. Wildfires in these areas will be controlled to protect old-growth qualities and resource objectives of this type. To achieve management goals and objectives,

[1] Page VII-24, 25, Forest Plan.
[2] Page II-61, Forest Plan FEIS.
[3] Declaration of Mike Hillis, Forest Wildlife Biologist at time of Forest Plan development.
[4] Page II-61, Forest Plan FEIS.
[5] Page II-62, Forest Plan FEIS.
[6] MA 21 allocations in the Forest Plan do not add up to 8% because of the old growth contribution within the roadless, wilderness, RNA, and unsuitable lands.

prescribed burning may be planned and executed to maintain or restore the composition and structure of plant communities, or for hazard reduction purposes. The Plan describes how harvest methods will range from 70 percent clearcut/30 percent selection to 100 percent selection, depending on habitat group, physical site conditions and resource needs.

FOREST PLAN MONITORING

1986 to 1990

After 4 years of Plan implementation, in 1990, post treatment monitoring of a unit harvested under the *Coney Timber Sale* indicated a need for review of the Forest's implementation of the Forest Plan's old growth management policies.

The *Coney* unit was a mature lodgepole stand that had scattered young larch. The unit was part of a large block of MA 21. The prescription recommended that all trees be removed except larch. These trees were protected contractually by a reserve tree clause. While the prescription was designed to recruit desirable seral species (larch), it was not clear during the monitoring whether the treatment was appropriate due to the lack of: 1) an age class and condition analysis of the remaining MA 21 area; 2) a similar assessment of the availability of unsuitable old growth in the area; and 3) a clear set of management objectives for the MA 21 area. The loss of the mature lodgepole constituted a long-term loss in stand structural characteristics. Because the Forest Plan did not provide for old growth recruitment via total regeneration of MA 21 stands, it was determined by the monitoring team that the treatment did not meet the Forest Plan goals for MA 21 under the strategy outlined within the 1986 Plan.

The results of the 1990 monitoring process indicated that MA 21 goals were not fully understood during project design and hence there was a risk of not fully meeting them during project implementation.[7]

1991 to 1993

In 1991, the Forest temporarily suspended all management enhancement activities in MA 21.[8] An inventory of old growth (both suitable and non-suitable lands) was initiated, and a team (Lolo Old Growth Committee) was assigned to reassess the old growth issue in relation to stand recruitment, ongoing research, and other agency efforts. In this same year, the Forest Supervisor issued interim implementation guidance regarding the identification and protection of special ***Old Growth Groves*** and ***Legacy Trees***.[9] [10] Within the interim guidance, the Forest recognized the important biological and social components of old growth groves, legacy trees, and old growth ponderosa pine communities. The Forest was not to harvest such groves and to manage them in a way that would perpetuate their character. Groves could be located in any management area, and the Forest would not stipulate a minimum or maximum number of groves to retain, rather that any grove of this character would be managed to perpetuate the limited resource.

> ***Old Growth Groves (Examples in 1991 Interim Directive)***
>
> *Western larch within the Finley Creek drainage on the Seeley Lake Ranger District with the oldest tree near 600 years old.*
>
> *Mountain Hemlock near Thompson Pass on the Plains/Thompson Falls Ranger District with trees near 300 year old.*
>
> *Western Red Cedar within the Guilt-Edge drainage on the Superior Ranger District with 6 foot diameter trees near 250 years old.*

Large, old "legacy" trees were also identified for their value. The Forest Supervisor stated that *"it is important to retain an appropriate number of large, old trees in harvest units. Called legacy trees, they have aesthetic qualities, help maintain a storied structure for vertical diversity, produce seed, and provide future snags"*.

During this period, the science regarding the effects of fire exclusion in low elevation ponderosa pine communities was developing rapidly. As a result of research being conducted by forest ecologists, the Forest identified the importance of preserving or enhancing the elements of biological diversity that had been lost because of historical logging and fire

[7] 1990 Forest Plan Monitoring Report.
[8] Internal memo 1920/2600 dated February 11, 1991.
[9] Second Internal memo 1920 / 2070 / 2470 dated February 11, 1991
[10] Old Growth groves contain the oldest representatives of late seral or climax communities across the Forest or contain trees of uncommon size, age, height or ecological character.

suppression in these communities (Losensky 1993). The 1991 internal memo also provided that the Forest would maintain old growth ponderosa pine communities and to look for opportunities to develop this rare community across the Forest.

By the end of 1991, the Old Growth Committee had reviewed five projects that had been proposed with treatments within MA 21 and old growth ponderosa prescriptions were refined and approved for several projects.

> ***1991 Old Growth Committee Actions***
>
> *Cherry-Helio Timber Sale – approved understory removal of Douglas-fir to recruit ponderosa pine.*
>
> *Deep Gilman Timber Sale – approved understory removal of Douglas-fir to protect old growth ponderosa pine from stand replacement fire.*
>
> *Road 4328 Timber Sale – approved species – designated removal of lodgepole pine from MA 21 stand to improve growth of larch and accelerate its development toward old growth.*
>
> *West Mountain Timber Sale – limited treatment to prescribed burning based on full stocking of ponderosa pine and small size of Douglas-fir encroachment.*

From 1991 through 1993 the Old Growth Committee continued to review and adjust project proposals to reflect the Forest's desire to protect or enhance old growth stands. Both the 1992 and 1993 Forest Plan monitoring reports provide examples of the types of adjustments made by the Forest. The adjustments included: changes to proposed harvest prescriptions, deferral of treatments, and requirement for additional analysis.[11] As Ecosystem Management Area (EMA) analyses were completed for various portions of the Forest, additional old growth (MA 21) was identified for allocation. On the Seeley Lake Ranger District, where no old growth had been originally allocated in the 1986 Plan because of the vast areas designated as wilderness, additional old growth was allocated outside of the wilderness. These reallocations increased the number of drainages where it was possible to meet or exceed the 8% objective.[12] [13] The Forest Plan was amended (Amendment No. 20) to include these additions.[14]

1993 Forest Plan 5-Year Review

In the ***1993 Forest Plan 5-year Review***, the Lolo recognized the need to consider current research in relation to old growth management.[15] In the review, the Forest recognized the need to consider the loss of old growth in ponderosa pine / Douglas-fir communities because of the absence of fire, the need to manage for old growth associated species, including flammulated owl and pileated woodpecker and the need to current research for stand sustainability and recruitment and to recognize pre-settlement old growth quantities in two elevation zones: the *mid/upper elevation zone*, and the *low elevation zone*.

In the review, it was described how in the mid/upper elevation zones, stand replacement fires burn every 80 to 200 years creating a mosaic of different-aged stands. Stands reaching old growth conditions tended to be small and isolated from other old growth stands. The size of old growth stands varied greatly, but the mean- and median-size were often less than 100 acres. The total amount of old growth in pre-settlement periods tended to represent a relatively small percentage of the landscape, generally 5 to 15 percent.

The review went on to describe how in the low elevation zones, low intensity under burns typically occurred every five to 30 years producing large tracts of old growth ponderosa pine representing 50 to 65 percent of the ponderosa pine community. In these areas, the target for retaining 8 percent distributed across the landscape was recognized as a major departure from pre-settlement conditions.

In a more recent article, Lesica *et al* (1996) suggest that old-growth occupied 20-50% of the pre-settlement forest landscape in low-and many mid-elevation habitats in the Northern Rocky Mountains…although their method cannot be used to accurately estimate pre-settlement age distribution. Much of the lands within this low elevation zone are in private residential or

[11] Item 1-3, Forest Plan Monitoring Reports for 1991, 1992, 1993
[12] 1920/2600 Internal Memo Dated December 10, 1993.
[13] 1920/1950 Internal Response Memo Dated June 14, 1994
[14] Forest Plan Amendment No. 20, June 16, 1994.
[15] April 1993, The Lolo national Forest Plan Five Year Review.

corporate ownership and are not managed with objectives to maintain old growth.

In response to the issue papers developed for the ***1993 Forest Plan 5-Year Review***, the Forest initiated two actions to: 1) consolidate previous forest supervisor memos into an implementation strategy for old growth; and 2) to ensure old growth recruitment for mid/upper and low elevation zones.[16]

1994 Lolo National Forest Old Growth Strategy

The ***1994 Old Growth Strategy***, was developed to provide for consistent implementation of the Lolo Forest Plan to retain 8% of the Forest in old growth reserves, to manage landscapes for ecological principles (which would therefore recognize old growth in the pre-settlement period), and to prescribe treatments that would consider the range of natural variation, age class distribution, and natural processes. [17]. The Forest determined, that by implementing this strategy, other landscapes containing old growth trees would be maintained in addition to the 8% originally allocated.

At this time, the Forest also began utilizing the ***Region 1 Old Growth Forest Type Characteristics*** as a means of identifying old growth.[18]

The ***1994 Old Growth Strategy*** provided direction for 1) inventorying old growth in each of the Forest's ecosystem management areas; 2) tracking those inventoried results in the TSMRS database; and 3) recognizing the variability of old growth inherent in different disturbance regimes. Eight criteria were provided for establishing a consistent means to inventory, analyze, and track old growth across the Forest.

1994 Directive for Old Growth

Ecosystem Management Areas (EMAs) will serve as the analysis area for making old growth allocations.

An assessment of existing old growth meeting the R1 characteristics will be completed during EMA analysis.

Old growth within unsuitable lands, if available and having adequate characteristics for distribution, habitat group, and patch size, is to be used to meet the Forest Plan 8% requirement where possible. These identified old growth management areas will be verified, mapped, and coded into the TSMRS database.

To achieve adequate representations of old growth, including the desired range of habitat type groups, patch size (larger is more desirable), or distribution, suitable lands will be allocated to MA 21 to make up the remainder of the 8%.

Old growth stands, or aggregations of old growth stands will represent a reasonable range of variability. These can vary from a few acres to large areas including numerous stands.

Where existing MA 21 areas do not meet the old growth type characteristics, MA exchanges will be completed so that the most desirable stands are allocated to MA 21.

If the analysis area does not have enough existing old growth to meet the 8% then stands that are relatively close to meeting the old growth R1 minimums will be identified as recruitment old growth.

When MA 21 is changed or old growth allocated in unsuitable areas, these modifications will be submitted to S.O. planning so the Forest Plan is kept current.

The ***1994 Old Growth Strategy*** recognized that old-growth is not naturally evenly distributed by habitat group, as the Forest plan originally implied. For instance, low elevation ponderosa pine landscapes historically had a very large percentage in old-growth which was presumably needed to meet certain species' needs. Conversely, high elevation lodgepole pine landscapes had less old growth, and presumably less was needed to meet species needs. This increased flexibility in the distribution of old-growth was fully consistent with the science available in the mid '90's (Fisher and Bradley 1987, Losensky 1993).

Green et al. – Old Growth Definition

The Green et al. definitions are based on old growth literature and analysis of a large body of

[16] The two action items identified in the 1993 Forest Plan monitoring report were considered to be non-significant changes, thus not requiring a Forest Plan amendment. The action items would be implemented through changes in project level decisions, further studies, improved coordination with groups and individuals outside the agency, and in-service awareness and training. Each item would be evaluated at the time of the next scheduled Forest Plan revision which has not yet occurred.

[17] (in service memo 2070, Daniels 4/29/94)

[18] Green et al 1992, which was again updated in 1995 to reflect more recent science on old growth.

data. They are the most widely accepted professional working standard to define old growth in the region (Pfister et al 2000). While Green and others do not recommend their quantified descriptions be used as absolute minimums, they do suggest they are appropriate for screening stands to identify potential old growth, indicating that most stands that meet these criteria would meet most other definitions as well.

Ecological Stratification

The old growth definitions are based on the habitat type classification system used for grouping forest types (Pfister et al 1997). These groups relate closely by temperature and moisture regimes.

The Western Montana Zone, in which the Lolo National Forest is located, extends from the Bitterroot Mountain Divide to the Continental Divide of the Rocky Mountains in Montana. This area is influenced by pacific storms, with relatively high precipitation in the winter, but is also in the rain shadow of the Bitterroot Mountains. Some continental climatic influence also occurs so the area typically receives a higher percentage of precipitation in the summer than northern Idaho. Some areas in western Montana have soils developed on volcanic ash, but much less than in northern Idaho. The area north of Missoula has landforms designed by past continental glaciation while the areas to the south have been primarily influence by glacial lake deposition, moderate river downcutting, and mountain glaciation.

Classifying Old Growth Types

The Green et al. old growth definitions were based on the Forest Service's National definition. In this definition, old growth forests are considered ecosystems that are distinguished by old trees and related structural attributes. They encompass the later stages of stand development that typically differ from earlier stages in characteristics such as tree age, tree size, number of large trees per acre, and basal area. In addition, attributes such as decadence, dead trees, the number of canopy layers and canopy gaps are important but more difficult to describe because of high variability.

Data from the Northern Region stand exam inventory were used as the basis for the old growth analysis (USDA Forest Service, Region 1, 1989). All plots that met a given set of criteria were used in the analysis.

Region 1 Old Growth Plot Criteria

Plots were survey type 45 and 46, which meet full standard exam procedures.

Plots were selected from stands with no evidence of logging.

Plots had an identified habitat type.

The largest tree on the plot was equal to or greater than 100 years old and ≥ 9 inches dbh.

The plot basal area for trees ≥ 5" dbh was ≥40 sf/acre.

A total of 1,068,000 plots were screened for the Kootenai, Flathead, Lolo, and Bitterroot National Forests in western Montana. The plot data was sorted into groups of similar habitat types. Plots in each habitat type group were subdivided by forest cover type based on plurality of tree species' basal area. Within each habitat type group and forest cover type group, plots containing large trees over 100 years of age were selected for further analysis. The guiding principle used in this assessment, was to select plots containing large, old trees that would represent the latter stages of stand development. The plots with large old trees were then further analyzed to determine the characteristics typical of old growth. The plots with old trees were analyzed for significant differences in trees ages, sizes, and forest stand structures and composition. Based on groupings of the data, three minimum ages were selected for trees within Western Montana.

Minimum Old Growth Ages for Western Montana

Ponderosa pine, Douglas-fir, western larch	170 years
Lodgepole pine	140 years
Other types	180 years

The plot database was stratified by habitat type groups and forest cover types. The forest cover type was assigned to the tree species with plurality of basal area for trees equal to or greater than 9" dbh. Data on numbers of trees by 4" diameter size class, basal area, layers, snags, decay, broken tops, age, and crown ratio where graphed in various combinations, analyzed in frequency diagrams, and displayed in tables.

Minimum screening criteria were then developed for each habitat type group and forest cover type by Forest. This data was then grouped into minimum criteria for screening stands of old growth.

Other minimum criteria including tree size, and number of large trees per acres, were used to distinguish stands where old trees were dominating the stand structure. The number of trees equal to or greater than a given age and size (dbh) were used as minimum screening criteria for old growth. Associated characteristics such as number of snags, down woody material, dead tops and decay, and diameter variation, represent the means, values, and ranges for structural characteristics found in the data for plots that met the old growth minimum criteria. Associated characteristics, however, are not required to be met in order to determine that a stand meets the Green et al. old growth definition.

Three broad old growth stand structures were recognized in this analysis.

Old Growth Stand Structures

Late Seral, Single-Story: *These stands are still dominated by the tree species and tree canopy later that first captured the site after stand replacing disturbance. The upper canopy is relatively closed. If understory trees were present, they are generally small, exhibit little growth, and do not form an apparent canopy layer. Other understory vegetation may be sparse. Ages and sizes of dominant trees are significantly beyond what may be found at culmination of mean annual increment of tree stand volume growth, growth rates are slowing, and tree crowns are showing signs of maturity or old age (flat, wide tops with slow main leader growth). This stage may have moderate amounts of tree decay, but little mortality, and few snags or pieces of down woody material.*

Late Seral, Multi-Story: *The initial seral trees and canopy have lost control of the site. Disturbance or the natural mortality of age has produced holes in the upper canopy; shade tolerant understory vegetation and trees are increasing in crown volume; and shade tolerant understory tree species are growing toward the main canopy, and may have occupied part of it. Two or more canopy layers are obvious, the canopy may be irregular, and broken tops, bole rot, snags, and large down woody debris may be common. The stand may have small opening dominated by shrubs or understory forbs. Although there may be some very large or old individual trees, stand average diameter and age may be either greater or less than in the previous Late Seral, Single-Story stage. There is often great variation in average tree diameter.*

Near Climax: *This stage is dominated by shade tolerant (possibly climax) tree species that captured the site after the initial seral stand has been largely replaced. A few remnant shade intolerant, early seral trees may persist, but they represent a small part of total live canopy. Depending upon overstory structure, there may be great variation in understory characteristics and tree diameter distributions. If the shad tolerant tree species are relatively short lives (such as subalpine fir), or only moderately long lived (such as grand fir), the canopy will be multi-storied, and contain significant numbers of snags and down woody debris. If the shade tolerant tree species is very long lived (such as cedar), there may be 1 dominant canopy layer, with relatively few snags or pieces of down woody debris.*

These broad categories are useful for explaining why an individual old growth stand may be expected to have, or not have, various structural characteristics. Individual old growth stands, however, may combine various elements of the three categories, or may have some other unique characteristic as the result of a particular site and stand history.

The Western Montana Zone, in which the Lolo National Forest resides, includes eight Old Growth Types which fit into these three broad categories.

Old Growth Evaluation

The Green et al. evaluation process provides three minimum criteria and seven associated screening criteria to identify stands that may meet the old growth type descriptions. These criteria are defined by Old Growth Type and Habitat Type Group. These criteria, along with qualitative evaluation, are utilized by the Lolo National Forest.

Old Growth Screening Criteria

Minimum Criteria:

Minimum Age of Large Trees *– The minimum average age for the largest size class for the old growth type.*

Number TPA/DBH *– Number of live trees per acre equal to or greater than a given dbh level and age. This would be the minimum number of live trees per acre equal to or greater than a set dbh level and age.*

Minimum Basal Area *– The minimum basal area in square feet for trees for equal to or greater than 5" dbh.*

Associated Characteristics:

DBH Variation *– Variation in diameter of trees equal to or greater than 9" dbh. The variation is classed in L=low (+0-20%), M=moderate (+21-40%), and H=high (+41-100%).*

Percent Dead/Broken Top *– The percent of trees equal to or greater than 9" dbh with dead or broken tops.*

Probability of Down Wood *– The probability that abundant down wood ≥ 9" diameter will be present. Probabilities are classed into L=low (+0-20%), M=moderate (+21-40%), and H=high (+41-100%).*

Percent Decay *– The percent of trees equal to or greater than 9" dbh with significant decay.*

Tree Canopy Layers *– An indication of the number or variation in numbers of tree layers than can be expected. SNGL = single layer; MLT = multiple layers.*

Snags ≥ 9 " *– The range in number of snags (dead standing trees) ≥ 9" diameter.*

No. of Samples *– The number of plots from the plot database that met the screening criteria and are used in the old growth type descriptions.*

Green and others provide a caveat to strict adherence to the quantitative data displayed in the minimum criteria. In addition to the numeric criteria, they recommend a qualitative assessment of each stand that considers natural variation, biological and social value, stand size and juxtaposition, and unique stand character.